8. (Amended) A method according to claim 6 wherein in step c) a set of distributions with different values of *M* and/or *L* are fitted jointly.

9. (Amended) A method according to claim 1 wherein at least one of the physical quantities of step c) is concentration of particles.

10. (Amended) A method according to claim 1 wherein at least one of the physical quantities of step c) is specific brightness of particles.

11. (Amended) A method according to claim 1, wherein at least one of the physical quantities of step c) is diffusion coefficient.

12. (Amended) A method according to claim 1 wherein the generating function is calculated using the expression $G(\xi) = \exp[\int dq c(q) \int d^3\mathbf{r}(e^{(\xi-1)qTB(\mathbf{r})} - 1)]$, where $c(q)$ is the density of particles with specific brightness q, T is the length of the counting interval, and $B(\mathbf{r})$ is the spatial brightness profile as a function of coordinates.

13. (Amended) A method according to claim 1 wherein the argument of the generating function is selected in the form $\xi = e^{-i\varphi}$ and a fast Fourier transform algorithm is used in calculation of the theoretical distribution of the number of photon counts out of its generating function.

14. (Amended) A method according to claim 1 wherein in step c) when calculating the theoretical distribution $P(\mathbf{n})$, the spatial brightness profile is modelled by a mathematical relationship between volume and spatial brightness.

17. (Amended) A method according to claim 1 wherein in step a) a confocal optical device is used for monitoring the intensity of fluorescence.

18. (Amended) A method according to claim 1 wherein said fluorescent molecules or other particles are characterized applying an homogeneous fluorescence assay.

19. (Amended) A method according to claim 1 for use in diagnostics, high throughput drug screening, optimization of properties of molecules and identification of specific cell or suspendable carrier populations.

20. (Amended) Confocal apparatus for performing the method according to claim 1 comprising:

a radiation source (12) for providing excitation radiation (14),

an objective (22) for focussing the excitation radiation (14) into a measurement volume (26),

a detector (42) for detecting emission radiation (30) that stems from the measurement volume (26), and

an opaque means (44) positioned in the pathway (32) of the emission radiation (30) or excitation radiation (14) for erasing the central part of the emission radiation (30) or excitation radiation (14).